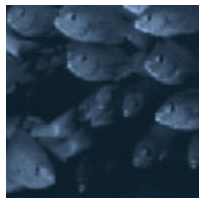
CGIAR GENDER PROGRAM

NET WORTH

Research with the Rural Women of Bangladesh



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Research with the Rural Women of Bangladesh

Consultative Group on
International Agricultural Research

Net Worth

Research with the Rural Women of Bangladesh

Written by Marlene Bedford and David Mowbray

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Photographs by Marlene Bedford and David Mowbray

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Abbreviations used in the text

BFRI Bangladesh Fisheries Research Institute

BRAC Bangladesh Rural Advancement Committee (an NGO)

CGIAR Consultative Group on International Agricultural Research

GO Government organization

ICLARM International Center for Living Aquatic Resources Management

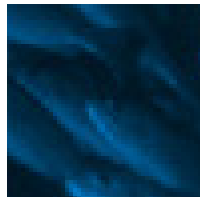
ICRW International Center for Research on Women

NGO Non-government organization

TMSS Thengamara Mohila Sabuj Sangha (an NGO)

USAID United States Agency for International Development

Foreword



The Consultative Group on International Agricultural Research (CGIAR) Gender Program began in 1991 and has been supported by funding from Australia, Canada, the Ford Foundation, the International Development Research Centre (Canada), the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States. Its objectives are to assist the international agricultural research centers in addressing gender issues by (1) strengthening the use of gender analysis in research aimed at technology development (Gender Analysis Program) and (2) improving the conditions and mechanisms within the centers for recruitment, productivity, advancement, and retention of highly qualified women scientists and professionals (Gender Staffing Program). One of the activities of the Gender Analysis side of the program has been to make available to scientists and other interested readers materials that further the understanding of gender analysis in research.

The CGIAR Gender Analysis Program argues that gender analysis is an essential social science tool for more effective technology development. In keeping with the lessons learned from other participatory research, agricultural research requires input from the eventual users of technology, the customers whose knowledge and preferences affect the decision about adoption. Women's knowledge, constraints, and preferences are different from men's and are too often overlooked, frequently resulting in technologies that do not suit the farmers who will use them.

At their annual meeting in 1995, members of the CGIAR took the agenda on the use of gender analysis in research one step further. They asked that as the sixteen international centers formulated their medium-term plans for 1998-2000, addressing the needs of poor rural women should receive a high priority under the goal of poverty alleviation. The rationale was twofold. First, there is increasing evidence that improvements in the livelihoods of poor rural women have direct benefits to their families. More frequently than men, women spend their increased income on food and healthcare for their children. Second, a stronger focus on women would require the use of gender analysis, enabling centers to better understand both men's and women's roles, knowledge, and preferences.

This is the fourth case study demonstrating the positive impact of including women's knowledge and interests as well as men's in agricultural research. It also demonstrates precisely the value of targeting women to achieve goals of poverty alleviation. Since 1990, the International Center for Living Aquatic Resources Management (ICLARM) and the Bangladesh Fisheries Research Institute (BFRI) have been working with poor rural women in Bangladesh. Their objective is to develop inexpensive and sustainable technologies for growing fish in seasonal and permanent ponds.

With the help of Bangladesh non-government organizations, scientists and women experimenters met and discussed workable solutions to pond aquaculture, especially seasonal ponds available for a few months after annual flooding. Scientists have learned from these women. They tested experiments with women to assess their viability over a wider set of conditions. They listened to women's constraints in providing inputs – such as competing uses for scarce resources like cow manure – and looked for better alternatives. The women have learned from scientists – specific techniques that have turned formerly stagnant ponds into sources of nutritious food and income, and habits of careful measurement leading to more predictable outcomes. And the women have benefited – from more and better food, increased income, and increased value in their own eyes as well as those of their families.

The stories contained in this case study testify to the value, increasingly recognized in CGIAR research, of working closely with partners and listening carefully to farmers. It demonstrates that women farmers as well as men are important collaborators and beneficiaries of careful research.

Support for this case study has come from the CGIAR Gender Program. We wish to thank David Mowbray and Marlene Bedford for capturing so well in word and picture the experience of ICLARM and BFRI scientists and the Bangladeshi women learning together how to improve pond aquaculture. We are also grateful to Dr. M. V. Gupta and Dr. Satyendra Datt Tripathi of ICLARM, Dr. Muhammad Abdul Mazid of BFRI, and the women in Mymensingh and in eastern Bangladesh who shared their experiences with the writers. Special thanks also to Joanna Kane-Potaka of ICLARM, who made the arrangements for this story to be written.

Hilary Sims Feldstein
Program Leader, Gender Analysis
CGIAR Gender Program

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Jessore women's group with their fish harvest. Inset: Ms. Mussamad Khatun, fish farmer in Jessore

RESEARCH WITH THE RURAL WOMEN of BANGLADESH

Introduction

It is difficult to imagine how hard life used to be for Mussamad Aleya Khatun when you see her today. Twenty-five, proud and confident, she stands on the bank of the large pond by her home in the village of Inayatpur, Bangladesh. She carefully arranges the weights of her hand fishing net and then in one graceful movement casts it out over the pond. A minute later she pulls in two large carp for her family's dinner.

It is equally difficult to understand at first how those two fish symbolize the new value her life has today. And it's all as a result of a research project that realized the women of Bangladesh were worth more than they thought themselves. Mussamad is not alone.

Today, thanks to the efforts of a consortium of researchers and government and non-government organizations, thousands of other rural women in Bangladesh can echo her experience.

Mussamad's parents were among the millions of rural poor in Bangladesh. With six brothers and sisters, she and her family had to rely on the kindness of others for a roof over their heads. "Yes, we were very poor," she says. "We had no limits to our difficulties. It was a very, very hard time. My parents were very much worried. We were living in the house of a kind person for about seven or eight years. He looked after us."

Her parents could not afford to send Mussamad to school. They arranged what they thought was a good marriage for her. At fifteen she married a man she had never met and her life took a turn for the worse. Mussamad's new husband demanded payment from her parents – a dowry they could not afford. He beat and threatened his young wife. "He was not a very good man," Mussamad recalls. "He wanted ten thousand taka ($200US) and so I left him."

After just one year in that terrible marriage, sixteen-year-old Mussamad walked away. She was alone, with no education, no skills, no way to earn any money, and no one to support her – an outcast.

Yet today, ten years later, Mussamad is doing very well. She, her mother, sisters, and a brother have all become participants in a research program that has changed their lives and in the long

run will change the lives of hundreds of thousands of the rural poor in Bangladesh. In the beginning it had nothing to do with women and everything to do with fish. She and other women are the chief beneficiaries of nearly a decade of research into seasonal pond aquaculture conducted by the International Center for Living Aquatic Resources Management (ICLARM) and the Bangladesh Fisheries Research Institute (BFRI).

Two Institutions

ICLARM is one of sixteen members of the Consultative Group on International Agricultural Research (CGIAR). It began operation in 1977 and joined CGIAR in 1992. Based in Manila in the Philippines, ICLARM collaborates with national research institutions in many developing countries to improve production of marine and aquatic resources in a sustainable and equitable way. ICLARM's partner in Bangladesh is BFRI.

Test ponds at the Bangladesh Fisheries Research Institute station at Mymensingh

BFRI was established by the government of Bangladesh in 1984 to conduct research into sustainable aquaculture and fisheries practices. BFRI's goals are to help improve the nutrition and incomes of the poorest in Bangladesh through sustainable management and development of aquatic resources, while at the same time finding ways to develop commercial fisheries. Staff at BFRI work closely with the non-government sector and with several international organizations, such as ICLARM.

BFRI operates four field stations, three of which specialize in research in specific aquatic environments – freshwater, brackish water, and riverine. The fourth station develops and tests marine fisheries technologies.

BFRI is semi-autonomous, with its own board of governors chaired by the Minister of Fisheries and Livestock of Bangladesh. Most of the scientific staff are male, but the Institute has made strides in finding and attracting women researchers in the past few years.

In the pond aquaculture program the two institutions operate in partnership, with ICLARM aquaculture specialists working side by side with researchers from BFRI.

Origins of the Pond Aquaculture Research Projects

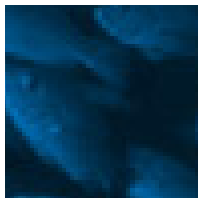
Bangladesh is a country that is more water than land for a large part of the year. People depend on the water. They live with the monsoon, the floods, the changing channels in the deltas of the Ganges and Brahmaputra rivers. These two rivers alone deposit more than two billion tons of silt in the deltas every year. During the four months of floods they also cover almost three-quarters of the land with a shallow layer of water.

"Can you imagine in the rainy season this is water as far as the eye can see?" asks Dr. Satyendra Datt Tripathi, ICLARM's aquaculture specialist in Bangladesh, as he looks out from the main highway near Mymensingh over what seem to be endless, empty fields. Much of the land is criss-crossed by high, narrow ridges, which serve as field boundaries and footpaths. During the wet season, they, along with people's houses and farm outbuildings, are all that is visible above the water.

Children dig and claw with their bare hands in the mud after draining a pond to pull out the small fish they display here.

While the monsoon floods severely limit the areas in which the growing population can safely live, sediment from those great rivers has left the land fertile, able to sustain large rice crops. The river waters provide fish. About three-quarters of the animal protein in the diet of the people of Bangladesh comes from fish that can be caught in the rivers and the flood waters.

Today more than 120 million people crowd onto the ever-shifting land area. The population density is more than 800 people per square kilometer, making Bangladesh one of the most densely populated countries on earth. This population density has put a great strain on the capacity of the land and rivers to provide enough food. Some estimates say that as many as 40 percent of the people of Bangladesh do not have sufficient incomes to sustain themselves, and a United States Agency for International Development (USAID) brief to the US Congress for fiscal year 1997 pointed out that "Bangladesh has the highest child malnutrition rates in the world, with two-thirds of children undernourished." In 1995 the government of Bangladesh itself stated that 39 million of its citizens could not afford a sub-minimal diet of 1,800 kcal/day. In Bangladesh millions go hungry every day. One of the reasons is that the rivers can no longer provide fish as they used to.



"Plenty of fish were available here twenty years ago," says Dr. Tripathi. "But because of changing circumstances, changing ecology, because of the draining of rivers and the blockage of the migration routes of fishes, the breeding of fish is impeded. The result is that… the fish population has decreased considerably and the fishing pressure has increased. The number of people in Bangladesh has increased, and for them there are not enough fish."

This situation has had a severe impact on the 80 percent of Bangladeshis who live in flood-prone rural areas and absolutely depend on fish for protein in their diet. Over the centuries they have adapted to the shifting waters, often building their homes high on mounds, which they created by excavating the river deposits. A network of roads and footpaths above the flood level links communities. The people of Bangladesh have excavated hundreds of thousands of pits and ditches to build these islands and ribbons of high ground. As a result, even when the flood waters recede, the land is left dotted with ponds full of trapped river water. They vary in size from smaller than .05 hectares to a tenth of a hectare or more. Families use many of these ponds and ditches for washing clothes and bathing and of course they harvest any fish that are trapped in them as the flood waters recede. It is common in Bangladesh to see as many as a hundred people – men, women, and children – digging with their bare hands in the mud after draining a pond to pull out the small fish that remain there.

Many rural Bangladeshis saw the potential to actually grow or culture fish in these ponds, but without proper technologies, without species of fish that could prosper and mature quickly in the shallow pond waters, their efforts were not very productive. Pond owners and operators lacked both the technical knowledge and the capital to bring these small pools to useful levels of production. Many ponds and ditches were abandoned, left to stagnate. Such small water bodies soon clog with weeds.

In 1989 these unused ponds caught the attention of ICLARM and the fledgling BFRI.

"In Bangladesh there are over one million ponds covering about 150,000 hectares. Only 50 to 60 percent of the ponds are utilized for fish culture and the rest of the water bodies lie derelict," says Dr. M. V. Gupta, ICLARM's original aquaculture project leader in Bangladesh. "In addition there are hundreds of thousands of small seasonal ponds, ditches, and roadside canals which retain water anywhere from three to six months, completely lying fallow, covered with water hyacinths, becoming breeding grounds for mosquitoes."

Water hyacinth chokes many ponds in Bangladesh

Researchers at both organizations saw in those derelict ponds and ditches an untapped resource that potentially could be turned into a new source of food and income – a way to reduce endemic protein malnutrition among the rural poor.

"The objective of this program is to undertake field trials of the aquaculture technologies that we have developed in our station," says Dr. Muhammad Abdul Mazid, the Director General of BFRI's station at Mymensingh, "and subsequently transfer the technology to the rural areas."

The Bangladesh Department of Fisheries estimated the potential for new fish production from all ponds in 1996-97 at 1.2 million tonnes, if modern, low-cost aquaculture technologies of the type the scientists at BFRI were testing could be introduced. Such production would increase the total Bangladesh fish crop by a staggering 82 percent! The potential to make a difference in the lives of millions of Bangladeshis is enormous.

"The prime purpose of aquaculture in Bangladesh is to provide food security to the people of Bangladesh, to let them generate income, to provide them employment, and to produce nutritious food for the malnourished people," says Dr. Tripathi. "We are generating low-cost technologies. That is the main purpose of our research."

In test ponds at BFRI's freshwater research station in Mymensingh, researchers experimented with different species of fish to find which would do well in the relatively shallow – less than one meter – depths of the seasonal ponds. The river fish that Bangladeshis are used to eating are carp, but according to Dr. M. V. Gupta, they did not grow quickly enough in the ponds.

"These major carp need a longer time to grow to market size and also they need deeper water, which is not the case with seasonal ponds," he says. "So we were looking for alternate species, alternate technologies that could be used to bring the seasonal ponds into aquaculture."

The researchers turned first to a species introduced from Africa, the tilapia, and found that the fingerlings could mature to a useful size before the ponds dried up. Tilapia were so prolific that once a pond was stocked, it was easy to maintain a supply of fingerlings (the young fish with which the ponds would be seeded each season) without the need for a separate hatchery. In fact the first species tried, the Nile tilapia, multiplied so quickly that it choked the ponds and had to be replaced in the research program with the red tilapia.

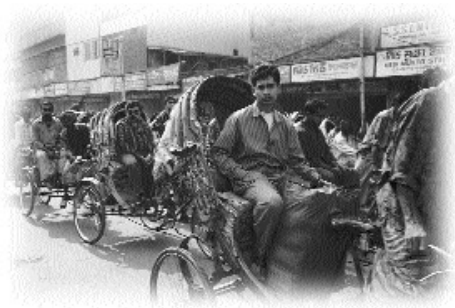
Other trials focused on other species, such as the silver barb, which are not common in Bangladesh but could do well in the ponds, according to Dr. Tripathi. "We are breeding a species of fish which are rare now in nature and which are very much liked and are very nutritious," he says.

At the research station, scientists had to find the right recipes for growing healthy fish. They had to come up with suitable pond preparation treatments to get rid of undesirable inhabitants, like frogs, snakes, and predator fish, which could eat the cultured fish before they matured. They had to determine the optimum types and quantities of fertilizers to encourage the best kind of aquatic growth on the pond bottom, and they had to determine the quantity and rate of feed the fish would need. Another variable was the number of fingerlings a pond could sustain. Furthermore, they had to find materials that their target group – the poorest, often landless, farmers – could actually afford. This meant minimizing inorganic inputs and maximizing local and on-farm material such as cow and chicken manure for fertilization, and rice bran for fish feed.

After exhaustive on-station trials, the researchers moved the work to real ponds to see if farmers could make the technologies work the way they had at the research station.

The primary purpose of the research was to develop strategies and technologies that would enable these farmers to breed economic quantities of fish in the seasonal ponds, without regard to the gender of the farmers themselves. But the researchers were conscious that rural women might be part of the research equation.

"Our target group was the landless and the poorest of the poor farmers," says Dr. Gupta. "In those households most of the men are engaged in wage or paid labor, either in agriculture or other activities, so they were not able to provide attention to these aquaculture activities."



So while the technologies were not explicitly designed for women and while women were not targeted specifically as prime beneficiaries, when it came time to move the technologies from the controlled conditions of the station at Mymensingh into real ponds, it was natural for women to become key implementers.

"Whereas most of the time women are at home, they are the best people to utilize these water bodies and also provide income and nutrition to the household," says Dr. Gupta.

Rural Women in Bangladesh

If there is one telling fact that reveals more about the status of women in Bangladesh than any other, it is this:

Bangladesh is one of the few countries on the planet where the life expectancy for women is less than it is for men.

While the situation is improving, figures presented by the government of Bangladesh at the Fourth World Conference on Women in Beijing show that in 1992 the life expectancy was 57.4 years for men, and 56.8 years for women. The Bangladesh government report to the conference stated, "The majority of women in Bangladesh are underprivileged, under-nourished, illiterate and poor. The life patterns of most women are conditioned by age-old traditions and male dominated institutions governing the family, society and the economy." The same report points out that in Bangladesh as in many of the world's poorest countries, "females eat last and least" and that adult women have a 29 percent lower calorie intake than men. Protein malnutrition among women is serious in rural areas.

In Bangladesh society, it is traditional for married women to remain at home, and in rural areas that means doing much of the farm labor. While some young, unmarried women in cities, such as the capital Dhaka, do wage work in the textile industry and other women work breaking bricks into crushed stone in construction, men

Women garment workers in Dhaka

form the vast bulk of the paid labor force. In rural Bangladesh, even though by law women can inherit land, it rarely happens. Men generally own the land, and with constant subdivision through generations of inheritance, the plot sizes are small. Supporting a family from the produce of the land alone has become a huge struggle. Male farmers often take cash-paying jobs to supplement their meager farm incomes. And of course many rural families do not own land at all and must lease their fields or work as farm laborers for others.

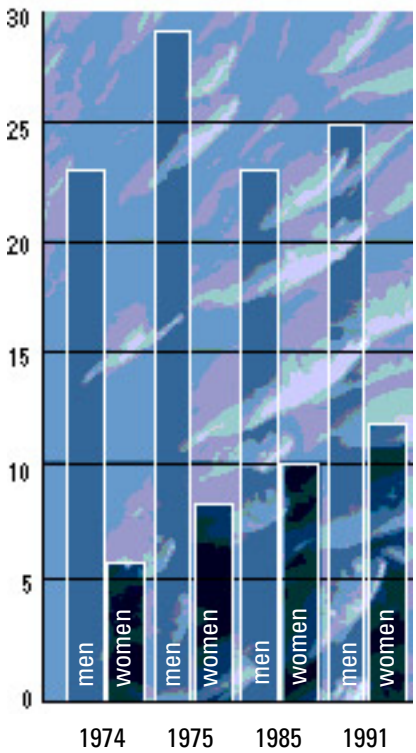
Women stay on the farm, taking care of children, preparing food, and taking responsibility for small farm animals like chickens. They often keep small vegetable plots for family consumption and help in rice postharvest activities such as seed selection. The work women do raising children and maintaining the household is undervalued, and they are rarely involved in major household decisions. Usually they do not have access to money.

The stresses of rural life take a severe toll on families in Bangladesh, with many marriages ending in divorce or separation. Because they are without property, without income, and without skills, women suffer most when a marriage disintegrates.

For women who are single parents, whose marriage has broken down with no spousal support, life can be extremely difficult, says Angela Gomes, the founder of Banchte Shekha ("learn how to survive"), a non-government organization (NGO) that tries to give opportunities to such women. "All the opportunities are for men," she says. "And there is a lot of social imbalance and social inferiority and there is a lot of superstition here and it is very difficult to overcome it."

One vital resource to which women in rural Bangladesh have less access than men is education. While the government of Bangladesh is making strides to improve educational opportunities for women, it will take a long time to bring basic literacy up from the very low levels seen today. Overall the national literacy rate is a meager 35 percent. Taken separately that becomes a 53 percent literacy rate for men but just 24 percent for women. There are more boys than girls in schools, especially at the secondary level. Data for 1994 show that only 12 percent of Bangladeshi girls attended secondary school, while a quarter of all boys did. Even in primary school, boys have a numerical advantage, with less than a third of the pupils in rural primary schools being girls. With tough choices about which of their children they can afford to send to school, parents almost always opt to send sons before daughters.

Gross secondary school enrollment ratio %



Source: Government of the People's Republic of Bangladesh. 1995. Country Paper, Bangladesh. World Summit for Social Development, Copenhagen.

Involving Women

While women were not a specific part of the original on-farm research plan, it was clear to the researchers that women could participate and that often men who took wage labor could not monitor the fish ponds every day. Nevertheless, they did not approach women to participate at first.

"To be honest,"says Dr. M. V. Gupta, who was the first ICLARM project leader in Bangladesh, "It wasn't until we started developing the technologies that we understood that actually the women would be the better people to be utilizing the ponds for aquaculture, rather than the men."

That view is echoed by Dr. Mazid. "The men are not taking care of the ponds because they are busy with other activities, particularly crop production. So we thought this would be a good method of income generating activity especially for the rural women."

But it was not as simple as just asking the women. Tradition in Bangladesh makes it difficult for men – in this case the scientists – to talk with women in their homes. Dr. Gupta says that having some women researchers from BFRI on the project made a big difference. "If we want to work with women on the research programs," says Dr. Gupta, "we found that female scientists have more advantages because they have the freedom to enter into the houses and the women farmers can talk freely with the women scientists."

Word of the new research project spread quickly, and what began as a trickle of women soon became a flood. "We started with a few women but when they came to know what we had been doing we got requests from so many that they want to participate in our activities, it was overwhelming," says Dr. Gupta. "If you look back now how many women are involved in this, there are thousands of women in different parts of the country all involved in aquaculture, especially seasonal pond aquaculture."

Leaders of groups who worked directly with women saw the potential for involvement right away. "The women can fish and throw the net," says Banchte Shekha's Angela Gomes. "Now they are involved in a lot of non-traditional work."

Jehanara Begum talks to women's group in Mymensingh

Today some 60 percent of the participants in the fish pond trials are women. The direct impact on those women is best illustrated through specific case studies and examples.

A Tale of Two Women

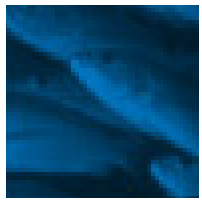
Jehanara Begum is a shy woman, not comfortable speaking publicly to large groups or giving orders and instructions to men. But several times every year, this fish farmer from Boilor Charpara near the Mymensingh research station does exactly that. She was one of the first farmer-experimenters in the seasonal pond aquaculture trials and now is a leader for other women in the community.

Jehanara had been married when she was just twelve, but soon after the wedding her husband divorced her, leaving her on her own. For years she raised chickens and did small craft projects like sewing and carving to generate enough income to get by. Then she attended one of the first meetings organized by ICLARM, BFRI and the Bangladesh Rural Advancement Committee (BRAC). BRAC is one of the NGO's that works with the rural, landless poor of Bangladesh. "The BRAC people invited us and twenty to thirty women farmers went there and we organized ourselves," she says. "That is how we started."

Using a basket net to scoop fish from the pond for eating

At the meeting they talked about growing fish in ponds like the one outside Jehanara's house. The meeting convinced her there was potential for her in joining the fish culture program, and in the years that followed, she evaluated several of the technologies from the research station. Some were not as successful as others. "When I first started feeding the fish, it was a little too expensive," she says. "Then I switched over to the new technology of feeding the fish with weeds and grass and I found that last year I had an income of 16,000 taka ($350US) and this year I hope to have a bigger income of 25,000 taka ($550US), spending only 2,000 taka ($45US) on fingerlings and lime."

Jehanara catches the fish she uses for food with a basket net, just a few fish at a time. She attracts them to the edge of the pond by throwing in some feed and scoops them out as they come to eat. When she is ready to harvest fish for sale in the market, she hires a professional net crew. They travel with their own large net from pond to pond. They pull the net across the pond and then methodically draw it in. But while the hired men catch the fish, it is Jehanara who is in charge. She inspects the catch and



instructs the men as to which ones are to be thrown back for further fattening and which ones are mature enough to be brought to market. Experience has made her both wise and cautious. "The small fish are not always available for stocking," she says. "So you take out the big fish and keep the small so that you will always have a crop."

Because when she first started in aquaculture she found the input materials too expensive, she is now trying a completely organic system developed at the nearby research station. But she had a farmer's skepticism about the new system too.

"In fact initially I was hesitant if the fish would really grow on duckweed and grasses," she says. "And this year I was very much concerned about it." But rather than give up or abandon the fish pond, she decided to follow to the letter the training she had received on the correct use of the new feeds and fertilizers. "Right from the beginning I followed the proper dosages for feeding the fish and the fish were being given adequate feed," she says. "The result is that the fish have grown very well and I am going to make much more profit and I am going to continue this kind of a thing in the future so that I am able to raise more fish. I stock the moment I harvest, so that there is a continuous cycle of big fish that I can harvest so that I can make more money."

Already, the bounty of fish in Jehanara Begum's pond has made a difference in her life. She has become an entrepreneur, something almost unheard of for Bangladeshi women.

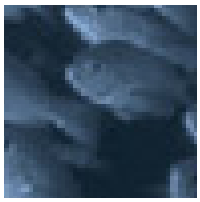
"I had a lot of problems before I started fish culture," she says. "With the income I have generated from fish culture, I have completed my house and I don't have to do all those other things I was doing earlier to make ends meet – stitching, carving, things like that."

Now, with the help of a training officer from BRAC, she leads the other women in the group, reminding them of the steps they must follow to raise fish successfully. At group meetings, about twenty members listen attentively to Jehanara's advice, respecting her knowledge and expertise. "All of them are involved in fish culture," she says. "And the knowledge I have adopted, they are also following and learning it from me. This is a very good technology and if we can also feed the fish well, then there will probably be better production."

Jubaydha Begum directs net crew

In another part of the country the story is similar. Jubaydha Begum leads a group of women fish farmers in Barisol Brahamanbaria in eastern Bangladesh. She lives with her son and three daughters in mud and straw one-room buildings. They are built on a small hill above the pond that she and the other women in the group are using for aquaculture. Like so many Bangladeshi women, she married very young, at the age of fifteen. She lived in the village all her life and never had an opportunity to go to school. Unfortunately, her husband died and she was left to bring up the children on her own. "He left very little to help manage the family when he died," she says, so life was very hard. Fortunately, at least for her, her eldest daughter didn't marry but instead stayed with her mother to help support the family.

"I was first organized by the Proshika, women's group," she says, speaking of the large NGO that helped her start in the pond aquaculture program. She became the leader of a small group of neighbors, and they all pitched in to work the derelict pond leased from a local land owner who had not seen the potential for fish culture. Proshika was able to provide funding to properly excavate the pond and also secured small loans for women to help them get started in the fish farming program. "In this group there are fifteen," says Jubaydha. "We want to increase our earnings to sustain ourselves. We want to be self-sufficient." So far, that is exactly what they have been doing. The pond has been very productive, and the women have been able both to sell fish in the market and to supplement their own diets. They are making money. Judaydha has some cash to invest back into the fish business for the first time in her life. Her son and two of her daughters are going to the free school established by Proshika. And for the first time in her life Jubaydha Begum has dreams for her children, dreams that were impossible just a few years ago. "I want my daughters to get an education and then work as woman teachers," she says. She is also confident that when the lease her group has on the pond expires, they will have enough money saved to rent another pond and keep their new business going.



Including the Non-Government Sector

While it is easy to dwell on the poverty and difficult conditions in Bangladesh, there is at least one area where the country has set an example for the rest of the world. Bangladesh has developed a unique non-government sector.

Bangladesh's struggle for independence, which ended in 1971, took a huge physical toll on many parts of the country. Indigenous relief groups soon formed to help rebuild the country and distribute aid and assistance to the millions of people who were without food or income. This sector flourished, and today in Bangladesh, not-for-profit NGOs can deliver services in both urban and rural settings that the government has neither the personnel nor resources to provide. Not surprisingly, given that so many women were victims of the war, many of the new NGOs developed very strong women's components and programs and worked hard to help and encourage women during the reconstruction. BRAC, Proshika, and the Grameen Bank are excellent examples in this area. Several NGOs, such as Banchte Shekha and Thengamara Mohila Sabuj Sangha (TMSS), decided to concentrate all their efforts on the plight of women and children in Bangladesh.

BRAC is one of the largest and best known NGOs in Bangladesh, and for good reason. It organizes landless rural families and arranges small loans to help them establish income-generating businesses – working with people the traditional financial institutions saw as very high risk. The small loan system is called "micro-credit," and it works. The Grameen Bank and BRAC have demonstrated that placing faith in the poor and giving them the means to help themselves is, in fact, a very low-risk proposition. Many other NGOs in Bangladesh have also established successful micro-credit programs. Today the small loan model that was born in Bangladesh is being used in developed and developing countries alike.

Early in the aquaculture research project, government organizations (GOs) like BFRI, realized that the government itself did not have the resources to organize and manage the field trials of the fledgling aquaculture technologies on its own.

"We are trying to develop the GO/NGO relationship so that the technologies that we develop can be disseminated all over the country and adopted by the people," says ICLARM's Dr. Tripathi. "Government institutions do not have the mechanism for reaching the people, and the non-government institutions or organizations have very good mechanisms for reaching the people, and they are also very well trusted by the farmers."

"We involved non-governmental organizations because they are working at the grass-roots level. They know the needs of the community, what their resources are, what can be sustained, and what cannot be sustained. So through them we can identify the needy women and the needy farmers," adds ICLARM's Dr. Gupta.

The researchers enlisted the assistance of several NGOs to move the aquaculture technologies developed at the BFRI research station into real seasonal ponds that could be managed and observed by farmers. BRAC, Proshika and other less well-known organizations such as Jagorani Chakra, Banchte Shekha, and TMSS agreed to participate. All the groups could provide training and organizational expertise and all had developed contacts with women and women's groups. They also had the monitoring and data-collection expertise so vital in assessing the outputs of the on-farm trials. All could provide the access to credit that farmers would need to pay for initial inputs and pond preparation. They could even help make lease arrangements with pond owners so women could have access.

Contact with an NGO made women like Mussamad Aleya Khatun, the fish farmer near Jessore, feel as though they belonged to something. "We came in contact with Banchte Shekha," she says. "We asked them if they would take us and they said yes, they could take us."

"Most women are poor and living in the villages," says Banchte Shekha's Angela Gomes. "Many of these women are beggars and they are living in very small huts. Now they have an opportunity to get training from Banchte Shekha in handicrafts and non-traditional work like… the fishery field."

Both NGOs and the researchers were taking some risks in the collaboration. But it was also a unique opportunity for both sides. Angela Gomes has high praise for the depth of the cooperation between her organization and the scientists. "The researchers discussed technologies with Banchte Shekha women," she says. "And our group members benefited, because without technology they cannot develop. They cannot increase their skill. Our women are very happy now."

Azadul Kabir Arzoo is the director of Jagorani Chakra, an NGO focusing on integrated community development. His organization has three hundred participants in ICLARM/BFRI farmer-participatory projects. He says that the experience of working with the scientists has been valuable for the NGOs, giving them new insight. "ICLARM people are our people. They walk where we walk," he says. "They know our culture and they think with us."

Aquaculture Research Results

From 1989 to the present, ICLARM and BFRI have conducted three distinct aquaculture research projects, all primarily funded by USAID. Each had a seasonal pond component.

During the Agriculture Research Project II (Supplement) project from 1989 to 1993, monoculture systems using tilapia (Nile and red) and the silver barb were developed and tested with farmers. ICLARM and BFRI collaborated with BRAC to identify and train participating farmers. The results both on the research station and in the on-farm trials were spectacular. Using cow manure as fertilizer and rice bran as feed, farmers were able to produce fish at a rate of 900 to 1,800 kilograms per hectare (kg/ha) of pond in less than six months. Even higher production was achieved in ponds where a mix of silver barb, silver carp, and mirror carp was cultured. The economic results of the seasonal pond aquaculture were also impressive. The research found that, for example, in the tilapia monoculture system, selling just a quarter of the fish produced would cover operational costs.

Two of the largest NGOs, BRAC and Proshika, which already worked with poor farmers, helped disseminate the technology on a large scale during this period, involving some 30,000 farmers in aquaculture.

The project was undertaken between 1993 and 1995 and placed even more emphasis on the on-farm research and work with NGO's. Different mixed or polyculture systems, where more than one species of fish was introduced into the ponds, were evaluated, depending on local conditions such as market demand, farmer preferences, and biological efficiency. The polyculture systems produced nearly twice as much fish per unit of pond area as the earlier monoculture trials – 3,000 kg/ha. Unit costs were lower than in the monoculture systems, making pond aquaculture even more profitable. The results are even more spectacular when compared with typical fish yields obtained by farmers before they tried the new technologies. For example, one study showed that fish production increased from 304 kg/ha to 2,574 kg/ha when the new systems were adopted. Even farmers who were not directly involved in the research began to adopt the technology without formal training or assistance and achieved yields of more than 1,000 kg/ha in the season between floods, triple what they had been able to produce before.

A third project, which began in 1995, is concentrating on even lower cost technologies such as using green vegetation and grasses as supplementary feeds. Biogas slurry, azolla (an aquatic fern), and vermiculture (using earthworms to convert organic waste into fertilizer) are being studied. This project was encouraged by feedback from the participants, especially the women, who were extremely sensitive to input costs and availability.

Women as Participants in Farmer Participatory Research

At first it might not seem obvious that there would be any differences between women and men as participants in the "farmer participatory research" trials. In fact, because the women had much less formal education and lower literacy rates than their male counterparts, they were expected to have more difficulty than men in applying the new aquaculture technologies efficiently.

But women proved to be efficient managers of the fish ponds and provided extremely valuable feedback to researchers in terms of the inputs that were recommended by the scientists, according to ICLARM's Dr. Gupta.

"They said 'No, this is not possible. We don't have these feeds. We don't have these fertilizers. We cannot afford to give it,'" he says. "'So, this is what we can give. Can we give this one or can we reduce the quantity?' So that is why in discussion with them, we altered the technology or modified the technology and they tested it on the farm."

Using a cast net to catch fish for family consumption

"We have received a lot of feedback from the farmers, especially with regard to the cost," says Dr. Tripathi, the current ICLARM project leader. "Whenever the programs have been such that the feed cost or the fertilizer costs have been increasing, the farmers have come to us about the non-availability of fingerlings, about the non-availability of certain species of fish, about the non-availability of certain types of fertilizers, non-availability of certain types of feeds."

This information was vital to the success of the research program, according to Dr. Tripathi. "We have to find alternatives," he says.

Feedback from the women participants has had an impact on the current direction of aquaculture research. Today Dr. Tripathi and the other researchers are experimenting with aquatic ferns and other available organic material.

As they expected, researchers found that conditions on the farms were often very different than those at the field station and varied from district to district. For example, when the on-station research suggested using a local organic material such as cow manure from farm animals as a pond fertilizer, in some districts women pointed out that manure was far too valuable to use in the fish ponds.

"They use it as a fuel and they cannot spare their cow manure for the purpose of fertilizing the pond," says Dr. Tripathi. "So this itself is a problem for research – to find an alternative for fertilizing the fish ponds. So we have worked on that."

Per hectare economic returns of pond fish culture in Mymensingh, Bangladesh

1Tk = $0.02US	Men research farmers	Men extension farmers	Women research farmers	Women extension farmers	Non-extension farmers
Yield (kg/ha)	2520	1698	3260	1451	981
Gross income (Tk/ha)	105840	74712	143440	58040	43164
Total cost (Tk/ha)	10523	22104	11949	13480	6455
Net return (Tk/ha)	95317	52608	131490	44560	36709

Source: Gupta, M.V., R. Islam, M.A. Mazid. 1998. Women Involvement in Pond Fish Culture in Bangladesh – A Comparative Socioeconomic Analysis. ICLARM (still in manuscript stage).

Sometimes women altered the conditions more than the scientists had expected. In one field trial the hope was to rear the silver barb fish in a monoculture as had been done at the research station. But some women mixed in other fish species and got much better results. It turned out that the polyculture – much closer to a natural system – let different species of fish utilize the resources in the pond more efficiently. The result was higher output at relatively lower cost.

"They knew what they were talking about, what they have, and what could be implemented," says Dr. Gupta.

"Well, you know I would say that some of those women…they stand out and can be regarded as leaders in aqua-farming in the country and they have shown light to many others," echoes Dr. Tripathi. "They have done it with their own hands. I think that is what is very necessary."

There are hard data to substantiate these statements as well. A study conducted by ICLARM looked at five different groups of farmers doing pond aquaculture – males and females participating directly in the research, males and females who were not direct participants but had received some technical assistance and loans from the facilitating NGO (called extension farmers in the study), and finally a group of fish farmers who had no involvement in the program. Almost all the ponds used by the farmers in the five groups were seasonal, stocked in June and July and harvested between November and February.

Women involved in the seasonal pond aquaculture research, at least women who were direct participants in the on-farm experiments, proved to be more efficient than men. In general they had both higher gross and net returns from their ponds. Their per-hectare production was higher and their cost of production was lower. These women tended to use less of the more expensive inorganic inputs such as urea. Their unit production cost was lower and hence their profit margin was higher.

As an example, researchers found that women participants produced fish on a per-hectare basis worth 131,490 Taka/ha ($2,900US) after expenses, while for male research participants the figure was just 95,317 Taka/ha ($21,00US). The women produced 30 percent more fish per hectare of pond for about the same amount of money as the men did.

"Throughout the project we are constantly monitoring and assessing the production and the other parameters and in some cases we got better results in our farmers' pond than in our own station production," says BFRI Director Muhammad Abdul Mazid. "This is because of the involvement there and this is also because of the women who are very serious and sincere about the activity."

When the study looked at results for the extension farmers who were trying pond aquaculture on their own without the constant surveillance of the NGOs or the researchers, the results for women at first glance were not as encouraging. Production levels for both men and women were significantly lower – though nowhere near as low as the yields from the group that was practicing fish farming without any of the new aquaculture technologies. In a reverse from the direct participants, the net income of the extension women was lower than for extension men. The men appeared to maintain higher gross production levels by spending more on inputs, both in the number of fingerlings they stocked their ponds with and the amount of fertilizer and feed – double what the male farmers who were actually participating in the research were spending.

But perhaps the most significant result was that in both cases the women fish farmers produced fish at a lower cost per kilo than men – as much as 30 percent lower.

Why would women in general prove to be more efficient managers of the fishery? Perhaps it was because they could observe more closely and pay more attention to the growth of fish. They could more easily maintain feeding and fertilizing schedules because they were "on-site" all the time. Both male and female fish farmers who were on their own had no detailed monitoring from the researchers – just what they had been able to learn from the NGO.

It is possible that the women "modified the recipe" to fit with the scarce resources they had available – a sustainable solution to a difficult dilemma. Men, on the other hand, with more access to capital, just bought more fingerlings at the outset and then fed them more food. Again, both of these groups of men and women had significantly higher total fish production than did farmers who had neither training nor access to technology.

It is possible that the explanation for these results is that men tended to look for profit with surplus fish they could sell, while women preferred to

Jehanara Begum directs net crew harvesting fish in her pond

spend less but make sure there were sufficient fish for family consumption first. This is the kind of gender difference in attitudes and practices that researchers had to take into account. It is certainly true that men – in particular pond owners – are beginning to see the potential for profit in their once-derelict ponds. As a result, rental rates for derelict ponds are rising, and many pond owners have decided to bring their ponds into production themselves.

Women-Sensitive Technologies and Strategies

The research trials did not set out to develop gender-sensitive technologies or strategies but, in effect, that is what happened, largely as a result of the research goal of making the fish pond culture an inexpensive, sustainable system. "We have not developed the specific technologies for women," says Dr. Tripathi. "But we have found that some of the technologies we have developed in general are easily adopted by them."

The most significant technology that women adopted is the pond itself. Because for many women the pond is part of the backyard and used for household purposes, working in or at the pond does not break any cultural taboos.

Women found it easy to utilize the more readily available feeds and fertilizers such as cow and chicken manure. These materials could usually be found on the farm itself and did not have to be purchased. Similarly, duckweed and other natural, locally grown fertilizers and feeds were easy for women to access. Some recommended feeds like rice bran did have to be purchased, but they were still readily available at the local level.

"We feed all kinds of aquatic vegetation or terrestrial grasses, banana leaves, rice leaf blades and grasses, and things like that," says Dr. Tripathi. "The cost of production is considerably lower and the production is relatively high."

Some traditional technologies have proved useful as well. Women can use basket nets to catch one or two fish for family consumption. Even the larger cast nets, though awkward and heavy, can be handled by women. Harvesting large numbers of fish for the market still requires professional crews of net pullers – teams who have large drag

nets that they can take from pond to pond. Both women and men working in pond aquaculture hire these crews. Some of the women's groups, however, have chosen to join the professionals with the dragging, wading into the thigh-deep water, a symbol of ownership and power.

"They have now more technology. They need many technologies but before they didn't know many," says Angela Gomes, referring to the needs of poor rural women.

The success of the work with women as farmer-participants has now spurred the researchers to look at specific technologies that women can be easily adopt. "We are now in the process of looking for certain technologies which are specific for women, like azolla culture, like vermiculture," says Dr. Tripathi. "These will have a great role in aquaculture. In fact vermiculture and azolla culture will be very, very important, and perhaps these will be specific technologies for women because they require no labor."

Mussamad Khatun and her sister have benefited from pond aquaculture

The Unmeasurable Impacts

The easiest impacts of the aquaculture research to see are the direct outputs – the before and after measurables – such as the change in the number of fish raised, the change in the income levels of the farmers, the quantitative change in the diets of participating families, and the number of adopters of the technologies.

But the change made in the quality of the lives of the families by income from fish farming, while impossible to measure, is also very significant. It occurs on a family-by-family basis. For every story that is documented in a case study, there are hundreds that are similar. As the technology of pond fish farming moves from research into application and as more women become involved, the ongoing impacts will be immense, even if precise numbers will be difficult to assign.

For example, Mussamad Khatun, the fish farmer near Jessore, has, with her mother and sisters, been able to send her brother to a college in Malaysia. They pooled their profits from the fish farming and their future prospects of profit to get a loan to finance his trip. Now he has a part-time job while going to school in Malaysia and can send some money home. In the long run, he expects to get a well-paid job. That will break the cycle of poverty for him and will help his mother and sisters too.

Jehanara Begum, the leader of the women's fishing group near Mymensingh, has used some of the profits of her fish farm to complete buildings on her property. She has a better quality home than she would have had otherwise.

And these are but two stories. "We did case studies in the beginning and now there are hundreds and thousands of case studies, and every story of every woman is a case study. When you go into the field you can see so many cases of women, how they started and where they are now," Dr. Gupta says.

There is also indirect evidence to indicate that family nutrition among the participants has improved. "Certainly nutrition has gone up because, for example, the fish production of the farmers who have been implementing this technology is around two to four tons per hectare," says Dr. Gupta. "So we did a survey to see how much of the fish they are producing is being consumed by the household, how much is being sold, and how much is being given to friends and relatives. We found that 50 to 60 percent of the fish produced by farmers with seasonal ponds is being consumed by the household."

Some of the impacts have been very subtle but have been documented, at least anecdotally, in some of the case studies conducted during the on-farm trials. Female participants mentioned that the increase in income improved relations within their families, and enhanced their status in their communities and in society in general. They were also quick to point out that maintaining the fish ponds did not take time from the other work they did in the home. "Their husbands give them more respect," adds Dr. Gupta. "And their social status has also increased in the community."

Conclusion

Since it began in 1989, aquaculture research in Bangladesh has demonstrated that it can benefit families through the inclusion of women and that the inclusion of women can benefit research. Making women integral participants in the research had not been part of the original plan. Though the gender of the participating farmers had not been considered at the outset of the research, it was women who were there, ready, willing, and more than able. When researchers started counting on women as well as counting the fish, everyone gained.

Even in a society where tradition mandates that women remain in the home, they showed they could contribute in ways that few had imagined. In the long term, in a land where the food supply and food security are under extreme threat, the importance of successful aquaculture in the underused, seasonal ponds is difficult to overestimate. Women are making a substantial difference as more and more derelict ponds are revitalized, and they take a leading role in making those ponds productive.

Just as important as the contribution those fish ponds will make to Bangladesh's food security is the long-term social impact using those ponds will have on the lives of Bangladesh's poorest women. The dramatic increases in self-esteem, education, and skills cannot be calculated. The women fish farmers will have status in their communities that they have never had before.

"The impact is clear now," says BFRI Director Mazid. "We have seen through the present demonstration and the farmer's rallies and through the profits they now achieve, that it is expanding.…They were pioneers."

One of those pioneers, Jubaydha Begum, the leader of the group in the village of Brahamanbaria, can now dare to have hopes for the future that were impossible to contemplate just a few years before.

"I did not go to school but two of my daughters do," she says proudly. "My life is better than my mother's and I know my daughters' life will be better than mine."

For all of the women who have participated in the research, as the value of the catch in their fishing nets has increased, so too has their own 'net worth.'

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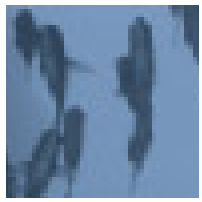

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